DATA PROCESSING DIGEST

A SERVICE OF CANNING SISSON AND ASSOCIATES

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General Information

"The fitful beginnings of office automation"

DUN'S REVIEW, October 1955; pages 57-64.

Data processing centers and improved systems are forecast

"The next decade will see breakthroughs in automatic processing and transmission of vital business data beyond the imagination of management today. These will be of such importance as operating tools that whole organizations will be replanned. Entire departments will be obliterated, reappearing in a different form and performing different functions." For example, "one company's planning envisions a data processing center in a part of the country where they have no manufacturing operation whatsoever. It will function as the hub of a vast data collection network, assimilate the information and then transmit it in analyzable form back to the plants, central executive and district offices."

American Telephone and Telegraph and Western Union foresee the setting up of "sub-collection points at strategic locations all over the U.S. Information from regional plants and sales offices would be transmitted using conventional five-channel teletype tape to these sub-centers. Here, the information would be automatically converted to data language on a computer medium--punched or magnetic tape or even punched cards, depending on how much data analysis or storage is required locally. Much diverse information would be consolidated and classified at the sub-center--inventory, production, and payroll data, for instance--before transmittal to the main data processing center. At the main center the partly digested data would be completely assimilated using general purpose electronic computers and auxiliary hardware. In an incredibly short time, concise reports would be on executives' desks, ready for action."

"Many companies and particularly small companies can move a long way on this road [to office automation] without buying new equipment solely by studying and simplifying their currently inefficient systems and procedures.... A big computer is a *must* only if you have enough volume to justify it."

Subscription information and the addresses of publishers of digested articles are given on the last page.

"Reading through departmental operating reports of companies that have gone as far as their resources and equipment manufacturers' technology permit, one is struck by the broad impact of relatively small ventures into integrated data processing [which] are amazing considering the modest investment in planning and new equipment, and the fact that seldom more than 10 per cent. of a company's total data processing is affected."

The above article is the introductory one in a series on office automation in this issue of DUN'S REVIEW. The additional articles are listed below:

"Good planning integrates order processing for better customer service," a case study of Scott Paper Company's use of integrated data processing to improve production planning, order processing, and sales analyses.

"27 companies evaluate the impact of new data processing techniques," with the consensus that "even small companies should begin studying it... but working it out takes more planning than management thinks."

"Here's how the producers look at the fast-moving data processing developments," with twelve manufacturers of equipment sharing their views.

"Where do you go from here? Start now to plan your studies." This is a list of books and films which may be used as a beginning course of study.

"Automation," Special Report

BUSINESS WEEK, October 1, 1955; pages 75-102.

Our expanding production capacity demands automation

Some highlights from the Special Report on Automation:

"Even if we applied all that we know about automatic control--the heck with costs--only a small segment of the labor force (perhaps 8%) would be directly affected by displacement, by upgrading, by downgrading."

"Three attributes appear in the descriptions [of automation] with surprising frequency. By themselves, there's nothing particularly startling about any of them. But there may be something in the synergistic effect of the three working simultaneously:

"Workers are employed more and more outside the production process...."

"Product flow is controlled by 'feedback' devices...."

"The product has been designed specifically for automatic production...."

"...it's fairly simple to identify four areas in which automation is active

today: Continuous process...Multiple tool...Numerical control...Data processing...."

"In automation today the factors of mechanization, supermechanization, and innovation are all at play. But another factor that's putting the squeeze on workers is unique in our history. That is the labor supply....high birth rates and low death rates have pushed our population to record levels....the size of the labor force is being held down by the low birth rates of the depression years, by high standards of living that allow youngsters to remain in school longer, and by more liberal retirement policies....The labor force is an exceedingly elastic thing."

"It is a historical fact that with higher productivity comes higher pay. This means more people with money to reach out for more services and more products.

"It's also a historical fact that in areas where labor costs are high or where manual efforts are too inefficient to meet the competition, there can be labor displacements, whether you call this trend automation or progress or anything else."

"Automation will cause some labor displacement....It's almost as certain that the highest reduction in jobs in the next few years will occur in offices rather than in factories."

"...the odds are against a man with a narrow, pinpointed training. The best, most flexible schooling a youngster can have is a good grounding in fundamentals, particularly mathematics and sciences. Vocationally, that gives him room to take advantage of the specialized jobs that develop. In a world of increasing leisure, too, the humanities are important, teaching people to get more out of life and to be better citizens."

((Reprints of the entire report are available from BUSINESS WEEK.))

"Automation and economics"

Milton H. Aronson, Instruments Publishing Company

Talk presented before The American Industrial Arts Association, April 27, 1955.

Four areas of automation can aid a healthy economy

Mr. Aronson defines automation as "the substitution of mechanical, hydraulic, pneumatic, electric, and electronic devices for human organs of decision and effort."

The specific fields of automation are listed:

"1. Plants or continuous-process manufacturing facilities for petroleum,

paper, foods, steel, etc.

2. Factories such as fabricators, engine plants, auto body factories, machine shops, etc....piece-part factories as contrasted with the continuous-flow plants...often...called 'Detroit automation.'

3. Offices--including retail, accounting, inventory, wholesaling, data processing.

4. Computation--including scientific and engineering calculations.

It is admitted that some overlap occurs, but each of these fields has different problems, uses different automation devices and different terminologies and can be considered a distinct field for automation."

The devices peculiar to each of the four fields of automation are described. In considering the oft-heard claims that automation replaces large numbers of employees, the author has found "that the installation of new controllers or new data processors permitted the company to do a bigger and better job--and that the number of employees involved in the specific department was not reduced. Yet we do not mean to try to establish that automation devices do not displace labor; they are designed to displace labor involved in routine, onerous, dangerous, menial and trivial tasks."

The author points out that economic health is affected by many factors which establish the degree of purchasing power of the people. "Hence, automation has no direct economic implications. It cannot make a sick country healthy or a healthy country sick. It can make a healthy economy still more healthy--and it might conceivably make a sick economy more sick. But it cannot be a fundamental cause for economic stability or instability."

"Do it now!"

Michael A. C. Hume, Peat, Marwick, Mitchell & Co.

OFFICE EXECUTIVE, October 1955; pages 7-9.

Check list for management survey of electronic needs

"Any management seriously interested in increasing office productivity can make several decisions now to obtain measurable improvement immediately and at the same time pave the way for transition to the automated office of the foreseeable future."

"...automation must be preceded by a careful analytical review of existing routines" and "it is likely that improvements can be made on the basis of existing techniques and conventional equipment..."

"...management can make the following 10 specific decisions:

1. Improve clerical work measurement.

2. Improve or install work scheduling.

3. Improve or provide written instructions.

4. Eliminate the unnecessary.

5. Seek fractional improvements as well as major ones.

6. Strive for a cost-conscious attitude.

7. Tap the latent ideas of the clerical workers.

8. Strengthen clerical skills.

9. Improve follow-up.

10. Decide now to make those improvements which you already know should be made."

"An approach to integrated data processing and control"
Alan O. Mann, SKF Industries, Inc., Philadelphia.

A.M.A. OFFICE MANAGEMENT SERIES No. 140.

A hub of information control

SKF has approached integrated data processing and control as an "attack on the problems of integrating communications, computation, and control in business and industry."

Present data are: "1) *Untimely,* because of lag and lapse; 2) *Periodic,* although actual operations are not; 3) *Balanced to pennies,* at the expense of dollars; 4) *Compartmentalized,* rather than unitized."

Another area of need is *decision making,* which needs new computational techniques derived from scientific principles.

"...within any single individual concern we [must] establish a complete two-way inter-connection between every transaction point in the entire company--field sales offices, field warehouses, factory control stations, purchasing, receiving, main warehouses, and main shipping operations. Every person in the system, wherever situated, must have instantaneous two-way communication with every other person through one master hub, a control center....The process [of communication and decision] must be continuous." A constant analysis must be run which will indicate when modifications must be made. This provides "the wherewithal for effective *feedback* control."

The corporation's communications problems are likened to the human body with a faulty nervous system, or with other diseases. The brain center must instantaneously locate the trouble and make a quick but accurate diagnosis.

SKF's solution will be the installation of 5-channel tape equipment, including teletypewriter equipment, and a "comprehensive set of electronic storage and computational equipment for all our data processing." Paper handling with the "hub area" or control center, is facilitated by a 24-channel belt conveyor through the department.

A description is given of the new customer order processing system.

SKF's purpose is not only to facilitate the processing of information, but to develop a scientific administration.

"The automatic office--industry's electronic pulse"

Dudley W. Hooper, National Coal Board, England

INSTITUTION OF PRODUCTION ENGINEERS JOURNAL, September 1955, pages 595-601.

Data processing equipment lags in England

The author feels that "data processing equipment," which term he applies to the medium size and smaller electronic computers, is of greater value to the office than the "universal" computers (which we call "large scale"). His concept of the state of the art in England may be seen in the following statement: "It is difficult to draw a fine distinction between an installation of modern punched card equipment with electronic calculating facilities and a complete data processing equipment, and in this country the latter is probably not so well represented as it is in America." This concept may account for the overall conservativeness of the article.

((It also appears that the author's definition of "data processing" is quite different from that of American writers, who generally do not equate a tool such as punched cards with a generalized description of business systems such as "data processing."))

"Organizational effects of electronic equipment"

Robert A. Rietz and Walter M. Harris, A. O. Smith Co., Milwaukee

N.A.C.A. BULLETIN, October 1955; pages 262-268.

Centralized data processing for decentralized plants

In a decentralized type of organization, a centralization of certain common functions could be effected to make the most efficient use of electronic equipment. It is suggested that accounts payable, payroll, accounts receivable, general supplies inventory, and fixed asset control are functions which could be centralized, relieving the product manager of each decentralized division or plant free to spend his entire time on management duties. The changes such centralization would introduce into the status of the accountant and the tabulating unit are discussed.

"Electronic equipment--a means, not a mystery"

Robert T. Bruce, J. P. Stevens, Inc., New York

N.A.C.A. BULLETIN, October 1955; pages 255-262.

Electronic equipment is viewed as a valuable tool which still requires man's ability to see a problem, and its solution, to interpret the problem in such a way that the electronic equipment can help him solve it faster, and more easily, and to provide reports which have been considered too costly by other means. An example of savings effected in the computing of a payroll on electronic equipment is given, and some generalized statements about the characteristics of the Univac File Computer are included.

"The coming victory over paper"

FORTUNE, October 1955; pages 130-132, 196, 199.

Top management is viewing paperwork as an operating problem of prime importance. Electronics is becoming the answer to this problem, but the great need is for equipment which can read printed and written information directly. The techniques used in Bank of America's ERMA point toward solutions to the paperwork problems.

"Automation--a survey"

R. J. Bibbero, Hillyer Instrument Co., New York

ELECTRICAL ENGINEERING, September 1955; pages 775-780.

A historical survey of automation is followed by descriptions of "Detroit" automation, job-shop automation, digital controls, electronic assembly, process control, and business automation.

"'Brain' trouble"

WALL STREET JOURNAL, November 11, 1955; page 1.

Some comments on the Eastern Joint Computer Conference.

"Electronic data processor--a milestone in machine method"

Harry D. Kerrigan, University of Connecticut

ACCOUNTING REVIEW, October 1955; pages 660-665.

"Greater standardization, greater simplification, and greater merging of accounting procedures" are the results of the use of EDP.

"An Introduction to Automatic Computers"

Ned Chapin, Illinois Institute of Technology, Chicago

New book--published by the author at Technology Center, Chicago, 1955.

A plan for studying computer needs, and justifying costs

"This book is written for the businessman who wants to know about automatic computers.... [it] discusses automatic computers from the business point of view..."

In the first eight chapters (covering 61 of the book's 245 pages), the author presents a plan for initiating a study of the use of electronic equipment in a business. He introduces the subject in a logical fashion, taking care to define new terminology as he uses it; and he does not assume his reader will understand what he means merely from the context, or from having read other material. Included in this portion of the book are chapters on what computers can and cannot do, suggestions for analyzing present business systems and evaluating the use of a computer in an improved system, employee relations as affected by new systems and equipment, figuring costs and savings of a computer, and justifying its purchase financially.

The next 81 pages of the book discuss automatic computer fundamentals, operation of the arithmetic and logic unit, the storage unit, the control unit, and output units. Following this, 20 pages are devoted to programming, using four rather general "tasks" as illustrations. The remaining pages of the book are devoted to miscellaneous topics (such as "errors"), an appendix with equipment comparison charts, and a glossary.

It is felt that the book would be strengthened if a case study had been reported, especially in the first eight chapters, so that some of the author's suggestions could be tied more directly to management problems. Also, the method used by the author for making a financial justification of the computer seems to imply that the data processing system performs practically the same operations as the old system; the possibilities of new procedures to do old tasks, and the possibilities of undertaking new operations which were not economically feasible before, are not brought out clearly. Finally, the author dismisses the problem of sorting, which is essential in all magnetic tape systems, by saying that it is difficult and uneconomical on general purpose machines.

It is expected that the book will be helpful to the executive who has not yet studied the potentials of automatic computers, and who is unfamiliar with the operation of a computer. The section on what computers can and cannot do is well done, and should help to dispel some of the erroneous beliefs and the "giant brain" attitude which are all too common.

The book is bound in a loose leaf binder. It may be purchased from the author. Price, $9.00.

"Automatic Digital Calculators"

Andrew D. Booth and Kathleen H. V. Booth.

Book--Published by Butterworth, London, 1953.

This is a well presented technical book on the theory of and logical design of computers, one of the very few written in this field. The 17 chapters and 228 pages cover material on the control and arithmetic units, storage and memories, circuitry, input-output devices, coding and programming. Although not a new book, it is one which should be included in the library of every computer engineer or others interested in the logical design of computing devices.

"Film guide for the control equipment user"

AUTOMATIC CONTROL, October 1955, pages 25, 26.

Films on data processing

Integrating the Office for Electronics (60 min.--16 mm-sound--$75)--Management Film Library, Dept. 100C, American Management Association, 1515 Broadway, Times Square, New York.

Direct Line to Decision (18 min.--16 mm--sound--color--free)--Modern Talking Picture Service, Inc., 45 Rockefeller Plaza, New York 20.

Univac (20 min.--16 mm--sound--free)--Remington Rand, Div. of Sperry Rand Corp., 315 Fourth Avenue, New York.

"The Search--Automation"

Film--M.I.T. (27 min.--16 mm--b&w--$6 rental)

Shows Automatic Control Research Center at M.I.T., demonstration of some principles of automatic control, linking of digital computer and a milling machine. May be rented from Young America Films, 18 East 41st St., New York 17. ((Reviewed in DUN'S REVIEW, October 1955, page 139.))

Equipment

"The Scope for Electronic Computers in the Office"

New book. Published by Office Management Association. Price: 15 shillings.

Survey of English computer manufacturers

Eleven papers are presented in this small volume by English computer manufacturers and the English representatives of American manufacturers. They are: Elliott Brothers Ltd. (Elliott 405), Leo Computers Ltd. (see DPD November 1955, page 12, "An English electronic office"), The National Cash Register Co. Ltd., Ferranti Ltd. (Pegasus), Power-Samas Accounting Machines Ltd. (Programme Controlled Computer), Burroughs Adding Machines Ltd., Remington Rand Ltd., The Plessey Company Ltd. (Plessey Electronic Payroll), British Tabulating Machine Co. Ltd. (Hollerith punched card machines), I.B.M. United Kingdom Ltd., and The English Electric Co. Ltd. (The Deuce). A highly readable introduction by the Rt. Hon. The Earl of Halsbury presents a brief survey of the history of the electronic computer from Babbage to the present. His message to potential users ends with these points:

"...your problem is not to learn something new, which is relatively easy, but to forget something traditional, which is much more difficult."

"...you will gain much more by buying what you may later come to regard as not perhaps the best choice...than by shivering on the brink..."

"Do not...acquire the minimum necessary to scrape home on the one job....You will probably want to tackle something more ambitious later."

"...do not overestimate...or underestimate...the importance of speed.... This speed is not kept up...when the machines are sorting, collating, arranging and indexing."

"Machines are not to be thought of as 'better' or 'worse' but as 'faster' or 'slower,' with larger or smaller stores. Speed and size of store are accordingly what you have to decide on. The relative merits of different machines in the same class are probably small compared to the advantages of having any one of them to work with."

ERMA (Bank of America's Electronic Recording Machine--Accounting)

"Cutting bank's paperwork"

BUSINESS WEEK, October 1, 1955; page 141.

"Electronics takes over bank accounting tasks"

WESTERN ELECTRONIC NEWS, October 1955; page 12.

"ERMA--Electronic bookkeeper"

RESEARCH FOR INDUSTRY, Stanford Research Institute News Bulletin, October 1955

"The Bank of America's friend ERMA"

FORTUNE, October 1955; page 131.

"B. of A.'s Paul Bunyan bookkeeper"

BANKING, November 1955; page 45.

Some facts about ERMA

ERMA is a big special purpose electronic machine designed by Stanford Research Institute to solve the bank bookkeeping problems of the Bank of America. ERMA will handle all bookkeeping functions for 32,000 checking accounts. Future production models will serve 50,000 accounts. The Bank of America needs 37 ERMAs to serve its branch banks throughout California. Customer's checks and deposit slips are preprinted with his name and account number on the face, and his account number in magnetic code on the back. Overstamps, dirt, ink, or other defacements do not interfere with this magnetic reading. When a check is inserted into the reader, the operator depresses keys to inform ERMA that the paper is a check rather than a deposit slip, and gives the amount of the check. Instantly, ERMA begins to search her memory for the account number she has read from the coded information on the back of the check. If there is no hold or overdraft information on the account number, and if the balance in the account is more than the amount of the check (these pieces of information are retained in two different sections of the memory), then the arithmetic unit completes the computation, records the new balance back in the memory, and notes the entire transaction in a temporary storage to be transferred later to magnetic tape. Meanwhile the check has been routed automatically from the magnetic reader into the check reader and sorter which sorts checks and deposit slips by account number to be sent out with the monthly statement. The monthly statement is printed from the magnetic tape history of each account on a high speed printer.

New products

OFFICE, October 1955

"IDP system," page 160.

The electronic Databosser automatically embosses fixed or variable data in metal plates at rates up to 6000 plates an hour. It can be activated by punched cards, magentic tape or perforated tape. Databosser is manufactured by Dashew Business Machines, Inc., Culver City, California.

"Facsimile intercom," page 164.

Western Union Telegraph Company offers on a rental basis, interoffice facsimile equipment which can reproduce a letter-size document in less than three minutes.

"Juke box uses ferrite-core memory"

ELECTRONICS, October 1955; pages 138-143.

This technical article on a unique use of ferrite-core memory in an automatic phonograph could lead to adaptations for business data storage.

"Digital printer with magnetic-core memory"

ELECTRONIC DESIGN, October 1955; pages 56, 57.

Potter Instrument Company's "Flying Typewriter" now has a magnetic core memory, and can be directly connected to some medium-sized computers without a magnetic-tape buffer. The printer can print 36,000 alphanumeric characters per minute.

"Punched card systems for the smaller installation"

JOURNAL OF MACHINE ACCOUNTING, October 1955, pages 18-20.

The Underwood Corporation presents a report on its experience in distributing the punched card equipment of the Power-Samas Accounting Machines Ltd., of London. These are small machines, processing punched cards of only 2" x 4 11/16" (40 column card), or 2" x 2 3/4" (21 column card). Recent applications of these cards are in Christmas Club control, and public library book charging systems.

Applications

"Univac File-Computer to streamline food wholesaler record-keeping"

R. R. Koenig, Super Valu Stores, Inc., Minneapolis.

SYSTEMS, September-October 1955; pages 24, 25.

Warehouse and buyer can know stock level at any moment

Super Valu Food Stores, Inc. of Minneapolis have spent two years studying their requirements and planning for a computer installation. They will use a Univac File-Computer for inventory control, billing, and sales analysis and general accounting functions. Super Valu's buying department will be directly linked with the File-Computer by means of an inquiry board. They may find the exact quantity of any item on hand by punching the stock number on the keyboard. The magnetically filed stock level is instantaneously printed on tape. The department will also be automatically notified when an item has gone out of stock or has reached a minimum re-ordering point. An inquiry keyboard in the warehouse will show on demand the location of any product in the warehouse, as well as the quantity.

"Electronics"

A. C. Vanselow, The Franklin Life Insurance Co.

BEST'S INSURANCE NEWS (Life Edition)--Part I, September 1955; pages 57-60. Part II, October 1955; pages 61-64, 68-69.

Univac in insurance application

A step-by-step description is given of the method by which the Franklin Life Insurance Company chose the Univac system for the entire range of their policy maintenance and other financial activities. The selection and training of personnel, programming, and a detailed explanation of the policy and agency commission applications is given in Part II, along with information on acceptance tests for the equipment, microfilming of records, technical information on the equipment, costs, and an evaluation of the benefits derived from the system.

"How computers can help to create their own programs"

Ben Conway, Price Waterhouse & Co., New York

OFFICE MANAGEMENT, October 1955; pages 24-26, 40, 42, 44, 80, 82.

Automatic programming

This is a discussion of the various techniques of automatic programming, which can result in a reduction of as much as 15% of programming time.

"Automatic programming for computers"

Dr. Grace M. Hopper, Sperry Rand Corp., Philadelphia.

SYSTEMS, September-October, 1955.

Routine clerical work in the final stages of coding may be reduced by the new automatic programming features of computers and compilers such as Univac and BIOR.

"The function of automatic programming for computers in business data processing"

R. J. Rossheim, Sperry Rand Corp., Philadelphia

Paper presented at the Association for Computing Machinery Annual Meeting, Philadelphia, September 14-16.

The development of automatic programming techniques is recommended to reduce the gap between the language of the user and the language of the machine. This will be of advantage in the training process, through the programming and coding phase, and in the continual revision of programs to meet changing conditions.

Training, Seminars, Meetings

"Conference on the Practical Utilization of Recorded Knowledge," Western Reserve University, Cleveland, Ohio; January 16-18, 1956. For further information write Dean Jesse H. Shera, School of Library Science, Western Reserve University, Cleveland 6, Ohio.

Engineering and Management Course, University of California at Los Angeles; Jan. 23 through Feb. 2, 1956. Includes five classes in data processing and related subjects among others. For further information write: Edward P. Coleman, Coordinator, Engineering and Management Course, College of Engineering, University of California, Los Angeles 24, Calif.

Western Computer Conference (IRE-AIEE-ACM), Feb. 8-10, 1956; San Francisco. For further information write Dr. Oliver Whitby, Stanford Research Institute, Stanford, California.

ORSA-TIMS Meeting (tentative), March 30, 31; University of California at Los Angeles.

Southern California Business Show (N.A.C.A.) April 24-27; Ambassador Hotel, Los Angeles. For further information write: R. E. McRann, General Chairman, So. Calif. Business Show, 731 South Spring St., Los Angeles 14, Calif.

N.M.A.A. Second Annual Electronics Business Systems Conference, Nov. 8, 9, 1956; San Francisco. Sponsored by the eleven Western N.M.A.A. Chapters.

OMISSION FROM THE NOVEMBER ISSUE:

Automation Consultants, Inc., publishers of "Office Automation: Integrated and Electronic Data Processing," by R. Hunt Brown, are located at 1450 Broadway, New York 18, New York.

Business Data Processing — A Review

Part IV – Information for Designing a Business Data Processing System

Outputs must be defined

The first step in designing an improved business system is to evaluate the feasibility and cost of the new system; and to prepare for ordering equipment and installing the system. The study involved in evaluating the feasibility and cost of the system is often not detailed, but to obtain cost estimates that mean anything it has been found best not to ignore any important details.

Systems design studies for either purpose require two steps: 1) a determination of the requirements or specifications which the system must fulfill, and 2) the development of the procedures and selection of equipment which will meet the requirements.

Here we will discuss the first step, *determining* specifications; that is, defining the required outputs of the data processing system. As mentioned in Part I of this series (DPD, June 1955, page 13), these outputs fall into four categories:

1. Legal, required information: payroll, tax reports, etc.
2. Data required by management about the operations.
3. Orders which must be issued to control operations.
4. Decision-aiding procedures which will be performed by the data processing system.

As designers of the data processing system we might assume that the first will be defined by accounting and legal staff, and that the last three requirements will be defined by management. Actually, management should not install new systems to meet old requirements; they should re-evaluate their own needs in terms of determining the best way to operate the business. This means that management consultants and operations research people are needed to re-evaluate management techniques. The systems designer will work with these people in order to inform them of the capabilities of the various tools (computer, etc.) available, and to better understand the data processing requirements which they finally determine.

But let us assume that these requirements are established. The systems designer must now gather together information on the exact content of the reports and forms required, including heading data, numbering systems, variable data, and the method of presentation and arrangement preferred (format). Several hundred outputs (forms, orders, etc.) may have to be studied. If the detailed design is in progress and automatic equipment is under consideration, information about the number of digits per item, number of items per line, etc., should be determined.

Knowing the outputs of the system, we must then determine how to gather the source data* to prepare these outputs. The first question is, what source data is required? This may be evident from direct analysis of the outputs. Usually, however, much of output data is derived from source data by summarization, statistical analysis, or by more complicated procedures (especially where "operations research" techniques have been used). By tracing through the computational procedures it is possible to determine the source data required for each report.

What is the source data capacity?

To be able to select equipment, program it, etc., it is necessary to obtain information about the number of source items generated per day (or week, etc.), the fluctuation in this rate, the number of digits per item, the form in which the data becomes available (typewritten forms from other companies, spoken message from operating people, etc.). At this point the designer might do well to review the relation between the source data and the final reports to determine that there is as little duplication as possible in gathering, processing, or in the presentation of data (except where the duplication is specified, or is inserted for checking purposes).

Note that throughout we are considering the data processing problems of the entire company; usually, to do otherwise may keep us from realizing important savings through reducing duplication.

In going through the above process it will become evident that certain data must be filed for later use. (See Part II, DPD, August 1955, page 13.) Establishing the number, content, and arrangement of files is one of the key points in designing data processing systems.

To summarize the design program, we must have information on:

a. The requirements management has for reports, orders, and other forms (both those explicitly required and those required implicitly by policies and rules). Naturally, all levels of management must be considered.

b. The computational processes for preparing outputs (reports).

c. The source data required to make the computations and prepare the reports.

A word of warning is in order: it is not advisable to short-cut the research required to obtain the requirements information. You would not expect an engineer to build a bridge without carefully surveying the area on both banks and the river bottom, too. Likewise a good systems designer must determine completely and quantitatively the inputs, outputs, and computational procedures required. For the purposes of making cost estimates and preliminary designs, it may be possible to estimate some of the data on volumes, item lengths, etc.; but even here the better the information, the better the estimates.

* Source data: data required for the first time and which cannot be derived from other data; also called "prime input" (see DPD, October 1955, page 5).

References

Accounting Review
American Accounting Association
College of Commerce and Business Administration
Ohio State University
Columbus, Ohio

Automatic Control
430 Park Avenue
New York 22, New York

American Management Association
1515 Broadway, Times Square
New York, New York

Banking
12 East 36th Street
New York

Best's Insurance News
75 Fulton Street
New York 38, New York

Business Week
330 West 42nd Street
New York 36, New York

Dun's Review
99 Church Street
New York 8, New York

Electrical Engineering
500 Fifth Avenue
New York 36, New York

Electronic Design
19 East 62nd Street
New York 21, New York

Electronics
330 West 42nd Street
New York 36, New York

Fortune
540 North Michigan Avenue
Chicago, Illinois

Journal of Institution of Production Engineers
10 Chesterfield Street
London, W. 1, England

Journal of Machine Accounting
241 North Michigan Avenue
Chicago 1, Illinois

N.A.C.A. Bulletin
505 Park Avenue
New York 22, New York

The Office
232 Madison Avenue
New York 16, New York

Office Executive
132 West Chelten Avenue
Philadelphia 44, Pennsylvania

Office Management
212 Fifth Avenue
New York 10, New York

Office Management Association
58 Victoria Street
London S. W. 1, England

Research for Industry
Stanford Research Institute
Stanford, California

Systems
315 Fourth Avenue
New York 10, New York

Wall Street Journal
44 Broad Street
New York 4, New York

Western Electronic News
328 North LaBrea Avenue
Los Angeles 36, California

See DPD October, 1955, for list of seventy-six periodicals regularly reviewed for significant information in the data processing and related fields.

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For the past year the publishers have been testing various methods of indexing the contents of DPD, in order to find a cross-referencing system which would be useful to its subscribers. The resulting index for volume 2, issues 1 through 8 appears below. The hyphenated numbers following the alphabetized look-up words give the issue number and page which have references to the look-up word.

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